

REMARKS

The Examiner is thanked for the careful review of this application. Claims 9 and 10 have been cancelled. Claims 1, 6, 16, and 20 have been amended to better define the claims. No new matter has been added. Claims 1-3, 6-8, 11-13, 16-17, and 20-22 are pending in the application.

Claim Rejections Under 35 U.S.C. §103(a)

Claims 1-3, 6-8, 11-13, 16-17, and 20-22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,556,812 to *Leuschner et al.*

The Examiner is thanked for the phone interviews of April 19, 2007. In the phone interviews, the undersigned and the Examiner discussed the Response to Arguments made by the Examiner in the Final Office Action, dated February 22, 2007, regarding the independent claims 1, 6, 16, and 20 using the open language “comprising”, which does not limit the process to hardening the patterned surface imaging material before the etching occurs. The undersigned agreed to amend independent claims 1, 6, 16, and 20 to clarify that the hardening process occurs prior to the etching process, as disclosed in the specification. The Examiner agreed that by clarifying that the hardening process occurs before the etching process, the claims would overcome the prior art.

As stated by the Examiner, *Leuschner et al.* teaches a process of patterning a low k dielectric material and the photoresist which is used to pattern the dielectric material contains silicon or can be silylated (*See*, col. 6, lines 38-48, and claim 3). The Examiner also alleges that *Leuschner et al.* teaches that after the photoresist material is applied to the dielectric material and patterned, the dielectric material is patterned using an oxygen plasma (*See*, col. 9, lines 23-25). The Examiner argues that it is inherent that the oxygen would lead to hardening of the silicon-containing photoresist during the etching process. However, *Leuschner et al.* does not teach “transferring the pattern defined in the surface imaging material to the layer of the low dielectric constant material after the patterned surface imaging material is hardened,” as defined in amended independent claims 1, 6, 16, and 20. The etching of the low dielectric constant material occurs after the patterned surface imaging material is hardened. Without the hardening process, the patterned surface imaging material would erode during the etching process to transfer the pattern to low k constant polymeric

material, as shown in photoresist 16 of Figure 1E. (*See*, p. 2, lines 16-20) Using an oxygen containing plasma to harden the patterned surface imaging material, to be a hard mask, prior to etching allows the hardened and patterned surface imaging material not to erode during etching of low k polymeric material. (*See*, p. 9, lines 12-13) A hardmask is important and needed in ensuring the pattern fidelity of low k polymeric material. (*See*, p. 2, lines 18-19)

The Examiner states that *Leuschner et al.* teaches using an oxygen plasma to etch the dielectric material; therefore, it is inherent that the oxygen plasma would lead to hardening of the silicon-containing photoresist. However, since the silicon-containing photoresist was not hardened first, prior to the start of etching the dielectric material, a portion of the photoresist would erode and the silicon-containing photoresist would not behave as a hardmask. The patterning fidelity requirement of *Leuschner et al.* is not as stringent as in the claimed subject matter. The patterning widths described in *Leuschner et al.* are a few microns, with examples ranging from 5 to 22 microns. (*See*, col. 1, lines 37, 63, col. 2, line 14, col. 4, line 18, col. 8, line 24, and col. 9, line 62) In contrast, the claim subject matter involves patterning techniques for features that are 0.18 micron and smaller. (*See*, p. 1, lines 13-14) Due to the large feature sizes of *Leuschner et al.*, pattern fidelity is not critical and pre-hardening of the silicon-containing photoresist to make the photoresist behave as a hardmask is not necessary. However, for 0.18 micron and smaller features, the patterning fidelity requirement is much higher and pre-hardening the patterned surface imaging material to make it behave as a hardmask is required.

Since *Leuschner et al.* does not teach each and every element defined in independent claims 1, 6, 16, and 20, Applicants submit that independent claims 1, 6, 16, and 20 are patentable over *Leuschner et al.* and request withdrawal of the rejections.


Claims 2, 3, 7-8, 12, 13, 17, and 21-22 are dependent claims of independent claims 1, 6, 16, and 20, respectively. Based on the arguments above for independent claims 1, 6, 16, and 20, claims 2, 3, 7-8, 12, 13, 17, and 21-22 are also patentable over *Leuschner et al.* As a consequence, Applicants request the withdrawal of their rejections.

Conclusion

In view of the foregoing, Applicants respectfully request reconsideration and reexamination of pending claims 1-3, 6-8, 11-13, 16-17, and 20-22. Applicants respectfully submit that these claims are in condition for allowance. Accordingly, a Notice of Allowance

is respectfully requested. In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at (408) 774-6924. If any additional fees are due in connection with the filing of this paper, then the Commissioner is authorized to charge such fees to Deposit Account No. 50-0805 (Order No. LAM1P111.CIP).

Respectfully submitted,
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